DOCUMENT RESUME

ED 090 493 CS 001 038

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TITLE The Effects of an Irrelevant Articulation Exercise during Reading.
PUB DATE Apr 73
NOTE 9p.; Paper presented at the Annual Meeting of the American Educational Research Association (New Orleans, October 1973)

EDRS PRICE MF-$0.75 HC-$1.50 PLUS POSTAGE
DESCRIPTORS *Articulation (Speech); College Students; *Learning Processes; *Reading Comprehension; Reading Processes; *Reading Research; Reading Skills

ABSTRACT

In an investigation similar to the early Secor (1900) and Pintner (1913) studies, a verbal distractor was used to demonstrate that comprehension of written materials, though reduced, was not completely disrupted when mature readers engaged in an irrelevant articulation exercise. Twelve undergraduate and graduate subjects participated in two conditions, one employing irrelevant articulation during silent reading and the other employing no articulation. A binomial test revealed that the irrelevant articulation subjects could perform significantly better than chance on the questions following each reading. The implications of this finding for the two-stage associative model of reading (Gillooly, 1972) are discussed. (Author)

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THE EFFECTS OF AN IRRELEVANT ARTICULATION EXERCISE DURING READING[1]

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In an investigation similar to the early Secor (1900) and Pintner (1913) studies, a verbal distractor was used to demonstrate that comprehension of written materials, though reduced, was not completely disrupted when mature readers engaged in an irrelevant articulation exercise. Twelve Ss participated in two conditions: one employing irrelevant articulation during silent reading and the other employing no articulation. A binomial test revealed that the irrelevant articulation Ss could perform significantly better than chance on the questions following each reading. The implications of this finding for the two-stage associative model of reading (Gillooly, 1972) is discussed.

The role of articulation in reading has long been a concern of teachers as well as researchers. The work of Secor (1900), one of Tichener's students at Cornell, is among the earliest on this problem. In an attempt to disprove the behaviorist notion associated with Watson that appropriate movement of the speech musculature is a necessary accompaniment of reading with comprehension, Secor (1900) sought to determine whether Ss could read and understand while engaging in the articulation of irrelevant materials (letter names). A number of other studies followed (Pintner, 1913; Reed, 1916) The results of these studies suggest that, while engaging in an irrelevant articulation exercise impairs comprehension of the written material, it does not prevent it.

CS 001 038

AERA New Orleans '73

Interest in this issue has been rekindled by the appearance of a two-stage associative model of reading proposed by Gillooly (1972). According to this model, the first or beginning stage of reading involves learning associations between letters (technically, spelling units) and their sounds. We will call these A-B associations. (See Figure 1) The sounds, or rather sound sequences, are in turn associated with information. We will refer to this as the B-C link. It is hypothesized that as a result of practice the A-B, B-C chain leads to A-C associations being formed as a result of mediation (Horton and Kjeldergaard, 1961). These A-C associations define the second or mature stage of reading and involve the conveying of information directly by letter sequences, that is, without the intervention of speech sounds.

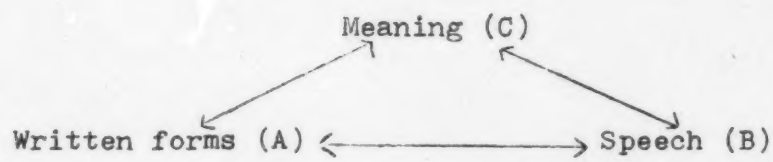

Figure 1: Meaning, Speech and Writing: A Triad

Since the model conforms to a mediation paradigm, a test of it may be derived from the control condition in a mediation experiment. This involves substituting a new stimulus into the B-C stage converting it to a D-C stage. With such a substitution, speech sounds (B) cannot act as implicit mediators between the written forms (A) and their meaning (C). In terms of reading this means that preventing the speech sounds from

acting as mediators should prevent comprehension unless A-C or writing to meaning associations have been formed. But how can speech sounds be prevented from acting as a mediating link?

One way to do this is suggested by the older studies which involved Ss in irrelevant articulation during the reading of materials. The present experiment is an attempt to determine whether a study similar to thses earlier studies, but employing more subjects and modern experimental designs and statistical analysis, would lead to similar results.

Method

Experimental design and subjects. The study employed a univariate design with each of twelve Ss tested under both conditions. The order of presentation of the treatments was counterbalanced (half the Ss underwent each condition first). Twelve upper division undergraduate and graduate students, 10 male and 2 female, participated in the experiment.

Materials. A set of eleven readings of about 350 words covering a variety of topics was selected from September, October and November, 1971 issues of the New York Times Magazine. For each reading selection a test of ten multiple choice items each with five choices was constructed to measure factual comprehension. Each reading passage was a Xerox copy of the original Times article. The questions were presented in a separate booklet.

Procedures. The Ss were tested individually. Each S was seated at a desk with E positioned to one side and slightly behing S.

One practice trial was administered to acquaint S with the procedure and the style of question he would be required to answer. Following this practice trial the ten remaining passages were presented in a different random order for each S.

Two reading conditions were employed: irrelevant articulation and no articulation. In the irrelevant articulation condition, Ss were required to say "13,14,15,16 " repeatedly in a tone audible to E during the reading. The no articulation condition consisted in normal silent reading. Each S served in the two conditions.

For both conditions E instructed S to read the presented passage through once. The E timed the readings so that S might be expected to read quickly without re-reading portions.

Test booklets were scored for the number of correct responses to the comprehension questions.

Results

The mean for the no articulation condition was 6.9; and that for the articulation condition was 5.56. A paired t-test computed with this data revealed a significant difference between the articulation and the no articulation condition groups ($t=2.51$, $df=1/11$, $p < .05$). Certainly this finding, that experienced readers can read with greater facility under normal rather than distractor conditions, is not surprising in light of the unusual nature of the articulation condition. But do the Ss read with comprehension?

In an attempt to answer this question both groups were compared to chance. Since there were five possible answers for each of ten questions, an individual performing at chance level would achieve a score of 2.0. Although one S did perform below the chance elvel in the irrelevant articulation condition (score=0.2), all other Ss performed above chance level in both conditions. A biromial test on this data revealed that these splits are statistically significant (irrelevant articulation, $p < .01$; no articulation, $p = .001$). It becomes clear, then, that Ss in the irrelevant articulation condition answered the questions above chance level leading to the inference that these Ss read the passages with comprehension. Models of reading which postulate graphic symbol to meaning associations have withstood this test.

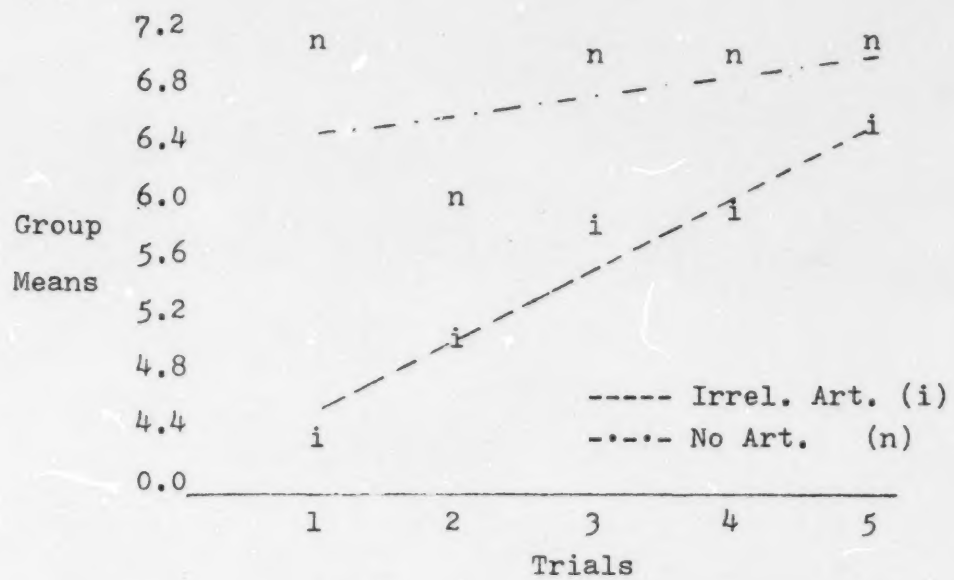

Figure 2. The slopes of the two conditions over trials

The investigators next looked at practice effects over the trials. By a method of least squares the regression lines of the two slopes were computed. Figure 2 shows the slopes of the lines over trials in each of the two conditions. Confidence intervals computed around these slopes revealed that the slope for no articulation does not differ significantly from zero ($p < .05$). The slope for irrelevant articulation, however, does significantly differ from zero ($p < .05$). This implies that Ss experience some practice effect in the irrelevant articulation condition. No evidence of a similar practice effect was found in the no articulation condition.

Discussion

The paired t-test revealed that Ss answered more questions correctly in the no articulation condition than the irrelevant articulation condition. The novelty of the irrelevant articulation condition provides a plausible explanation for this finding. The novelty explanation is further reinforced by the graph in Fig. 2 which shows that Ss improved over trials in the irrelevant articulation condition nearing the level of the no articulation group in only five practice trials. One may wonder if with further practice Ss using distractors could in fact attain the level of performance reached in the no distractor condition. A further study engaging Ss in several more practice trials is needed to investigate this possibility.

Of greater interest to the present experiment, however, is the demonstration that Ss consistently performed above chance

level on the comprehension questions. This implies, as did the earlier studies (Secor, 1900; Pintner, 1913; and Reed, 1916) that Ss can indeed comprehend reading materials while voicing an irrelevant distractor. This conslusion that Ss can read without reliance on speech sounds for gaining meaning is all the more credible in the light of other studies. Deaf Ss profit from orthographic structure as much as hearing Ss (Gibson, Shurcliff and Yonas, 1970). Edfeldt (1959) found that while all Ss engage in some subvocalization, experienced readers employ silent speech only when they encounter novel or difficult materials. The two stage model is not embarrassed but rather strengthened by Edfeldt's finding. The model requires experience for mediation to take place. Edfeldt employed experienced readers. When experienced readers are forced by novel or difficult materials to engage in subvocalization, they presumabley regress to the model's earlier state in reading which requires subvocalization.

The distractor method used here is based on the assumption that the speech musculature cannot function for silent speech while it is actively involved in oral Speech. Edfeldt (1959) questioned whether it is possible for the two processes to occur simultaneously by sharing the speech musculature. If this were so, the practice effect observed in this experiment could be interpreted as involving better success in integrating both silent and oral speech in the situation, rather than demonstrating more efficient reading, that is, reading using direct writing to

meaning associations without going through speech. Since the Edfeldt (1959) question remains unresolved the present evidence is insufficient to prove that the Gillooly (1972) model accounts for mature reading, for the simultaneous sharing action or the presence of mediation may both explain the data. The data reported here are useful, however, in that the absence of such evidence would be sufficient to raise serious doubts about the validity of the model. For if the investigation had shown that Ss comprehension was completely disrupted while engaging in irrelevant articulation, it would suggest that no direct graphic symbol to meaning associations were present as a result of mediation.

A developmental study of the effects of irrelevant articulation on reading is planned.

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Footnotes

1. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, February 26, 1973.